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Serial No. 10/065,865

121985-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Number: 10/065,865

Confirmation Number: 3389

Applicant: John Yupeng Gui et al.

Filed: 11/26/2002

Group/Art Unit: 3687

Examiner: Shin, John Y

Docket Number: 121985-1

For: SYSTEM AND METHOD FOR PROVIDING INTELLIGENT ASSET  
MANAGEMENT AND TRACKING CAPABILITIES

DECLARATION OF JOSEPH SALVO  
UNDER 37 C.F.R. § 1.131

I, Joseph Salvo, hereby declare as follows:

1. My name is Joseph Salvo and I currently reside in New York; my current address is 1155 Avon Road Schenectady, New York 12308.
2. I am a named co-inventor of the invention disclosed and claimed in the above-identified patent application, serial number 10/065,865, filed with the United States Patent and Trademark Office on November 26, 2002 and assigned Attorney Docket Number (121985-1, and alternatively 30011).
3. At the time the invention claimed in the referenced application was made, I was employed by General Electric Company at its Corporate Research and Development facility in Niskayuna, New York as the Manager of the Pervasive Decisioning Systems Laboratory.
4. My co-inventors and I conceived and reduced to practice the subject matter disclosed and claimed in the above-referenced patent application prior to June 11, 2002. Such conception and reduction to practice is evidenced by the General Electric Patent Disclosure Letter, dated December 10, 2001, a true and

accurate redacted copy of which is attached hereto as Exhibit A. Such conception and reduction to practice is also evidenced by GE presentation titled, "Materials Management Digitization Program," a true and accurate redacted copy of which is attached hereto as Exhibit B. The disclosure given in Exhibit A and Exhibit B illustrate a system and method for enabling enhanced asset management and tracking capabilities as disclosed in the present application.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. Furthermore, these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code §1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Inventor



(Joseph Salvo)

Date

4/13/2009

GE Patent Disclosure Letter System

DOCKET NUMBER

30011

DOCKET DATE

Monday, December 10, 2001

TITLE OF INVENTION

Intelligent e-tags and their applications

GE TECHNOLOGY AREA(S)

Keywords:

Keywords:

EXHIBIT A  
IN SUPPORT OF DECLARATION  
OF  
JOSEPH SALVO  
UNDER 37 C.F.R. § 1.31  
(REDACTED)

[REDACTED]

[REDACTED]

[REDACTED]

Keywords:

[REDACTED]

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Keywords:

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PROJECT NAME

[REDACTED]

PROJECT NUMBER

[REDACTED]

PROJECT LEADER

[REDACTED]

[REDACTED]

4/1/2009



## BUSINESS OR ORG. CONTACT INFORMATION

NAME

PHONE NUMBER

Circumstances invention conceived i.e., described in patent notebook (include page #), technical report, letter, discussed in meeting minutes, etc.  
Some ideas came up at intelligent sensors brainstorming session. Some ideas were generated through experimentation with RFID tags and through implementation of an RFID proof-of-concept project.

## ABSTRACT OF THE INVENTION

Please write a brief explanation of the invention (Limit to 350 words).

We propose to develop intelligent e-tags (or called functional e-tags) that have at least one of following functions: 1) RFID (radio frequency identification) with sensor capability (sensor tags); 2) RFID with signal processing and/or decision making capability; 3) RFID with tag-to-tag communication capability; and 4) RFID with ultra-low or self-power capability. In general, a RFID tag means an electronic device that can communicate specific identification information through radio frequency communications techniques. Incorporating/integrating sensor capability greatly expands RFID tag's capability in the following ways: 1) It not only stores and communicates its ID information, but also its environment conditions. There are a variety of chemical, physical and biological sensors that can be integrated with RFID tags. These sensor tags can be used for monitoring the location, activity or/and conditions of the tracked assets, machines or processes. For example, a vibration e-tag by combining a vibration sensor and RFID tag can be used to report the vibration level of a heavy machine. 2) Its RFID communication can be controlled by its sensor signals. For example, a speed tag can activate the tag power and record/broadcast its speed once the tag reaches a pre-set speed. The signal processing and decision making (SPDM) capability is very important for distributed signal

processing and pervasive informatics. SPDM system can either be a modular unit or an integrated board on the tag. With SPDM, processed data, rather than raw data, are stored or sent out. Better yet, a decision is sent out to a control unit for automated operation. Tag-to-tag communication enables two-way data sharing, thus localized diagnostic and control. Different tags with different sensing capabilities and decision logic will enable cross-analysis of a matrix of information in a collaborative fashion, rather than singular sensor data analysis. Self-powered or micro/nano-powered tags are critical for tag life. By self-powered, we mean the power source being acquired from the environment, rather than battery. Examples of self power are power generated from temperature gradient, pressure difference, vibration, movement, radio wave background, light, and wind. It can also be considered to use trace level radioactive material without any harm to people to power the tags.

#### BACKGROUND OF THE INVENTION

Please describe the problem or requirement addressed by your invention.

Current RFID devices are mainly a 'license plate' or self-identification devices with limited wireless communication capability. There are many applications where this identification information is inadequate. Some advanced RFID tags may possess memory and/or writable functions. The most advanced RFID tags may even have temperature or power sensing capability. However, there are needs where users may want to know the environmental conditions of the tags or to regulate tag's operation based on specific parameters being monitored. For example, users may want to know whether his delicate shipment has been tilted outside specifications or whether his precision instrument has experienced any impact. Another example would be that a tag may signal if its pressure reading exceeds a pre-determined value - such signal may be either visible, audible, or a combination. Currently, sensors are usually hard wired (point-to-point) and do not indicate identification information. Wiring sensors for power and/or communication is not only expensive, but may also be impossible in many cases. Two-way communication between sensors is critical for localized diagnostics and control. Two-way communication is also important to achieve data reliability with minimum sensors. In the remote service industry where machine health condition is assessed through the sensor data, it is common practice to increase data reliability through the use of multiple sensors for one target variable. This sensor redundancy results in high installation costs and sometimes forces product design change. There are two types of data that are generic to all product and important for most of service industry: one is



static data such as product material, manufacturing date, and product specifications, another one is dynamic data such as operation conditions, and performance parameters. The first type of data can be addressed by an identification code (such as serial number) that may be conveyed through a barcode or a RFID. The second type of data can be obtained by combining local sensor readings and RFID identification codes.

How has this problem or requirement been addressed before?

Product or material identification has been done by physical marking, paper labeling, barcoding or RFID devices. Marking and labeling require extensive manual operation with great potential for error. Barcoding greatly reduces entry errors and speeds up data flow, but still requires manual operation. RFID automates the identification process and can record both static and dynamic information. Operation conditions and environmental parameters can be monitored by many types of sensors. Those sensors can be either integrated into an existing product or produced as add-on devices. Those sensors are usually wired for external power and communication to a collection box such as a computer.

Please list any relevant literature or patents of which you are aware.

#### DETAILED DESCRIPTION OF THE INVENTION

How does your invention work?

The proposed intelligent e-tags (or called functional e-tags) will have some or all of following features: 1) Wireless identification and sensor data transmission through radio frequency communication 2) signal processing and/or decision making capability, 3) tag-to-tag communication capability, and 4) ultra-low or self-power capability. An intelligent tag will be manufactured by either integrating sensors and RFID tag into one simple chip or by attaching miniature sensors to a special RFID tag that has A/D, processing or/and memory capabilities. Intelligent tags differ from current RFID tags in many aspects. First, they not only store and communicate their ID numbers, but also their environment conditions. Furthermore, the RF communication can be controlled by a designed sensor signal, or the sensor

4/1/2009

operation can be controlled by the RF communication. Lastly, intelligent e-tags can conduct two-way communications. Please read appendix 1 for continuation.

**Describe the important features of your invention and explain how to use the invention to solve the problems described above.**

The most important feature is that intelligent e-tags combine identification, monitoring, processing and wireless communication together. Such an e-tag will enable pervasive informatic networks that will greatly enhance supply chain efficiency and revolutionize the product service industry.

**What advantages are provided by your invention?**

The advantages are: 1) Tags not only provide ID but also targeted sensor data; 2) Tags with data processing capability (or signal conditioning capability); 3) RFID and sensor can be inter-controllable; 4) tags with two-way communication; and 5) Tags with self-power capability.

**Briefly describe any efforts to make a prototype of your invention or to test your invention. Additionally, summarize the results of any related experiments and testing and highlight any results of particular significance.**

We have constructed two functional tags by combining a force sensor and a tilt sensor to an active RFID tag with memory. By applying forces to the force sensor, we can receive the force data wirelessly using a handheld device. The same is achieved for the tilt tag. We are in the process to design a collision tag by integrating an accelerometer with a RFID tag. The tag will be in an inactive mode, but will begin transmitting when there is a collision and the related data (date, time, collision level, collision direction, etc) will be recorded.

4/1/2009



[REDACTED]

41,3909

# EXHIBIT B

## TN SUPPORT OF DECLARATION OF JOSEPH SALVO UNDER

37 CFR

61.131

REDUCTION

### SCOPE - eTags/MANM System - STIGEN

- Use eTags on all eTags MANM shipped to Project Sites (Implementation Schedule 30-40 m)
- Examine Enhanced RFID Tag Functionality with CRD to apply to existing GEPs process.
- Validate Benefits to Support Further Roll-out to MSD Material (Full Rollout - 10/02)

### Fig 4.2 - eTag/MANM System

- Consolidation of All Project Material Data (GT, STIGEN, MSD)
- Leverage existing technology within CRD application
- MANM focuses on later integration into existing GEP-over.com application.

### Cost Benefit Summary

#### Incremental Program Benefits w/ eTags (5MM)

(est) 2004

### Schedule of Deliverables

- Final/Next System - Proof of Concept 9/1/01
- Functional tag demonstration 9/1/01
- Site Review - Allocate budget for 02 10/15/01
- Rollout (STIGEN, GT) 10/15/01
- MSD 10/15/01 - 12/31/01

### Key Success Factors -> Metrics

#### STIGEN MATERIAL PILOT

- Track 100% STIGEN material with eTags shipped to Project Sites
- # of GE Field Personnel 2 Customer 2 performing site/invent
- equipment inventories
- Reduction in mis-directed, lost or missing material shipped to Project Sites

#### eTAGS/MANM SYSTEM - (GT, STIGEN, MSD)

199

### Inter-Dependencies

- Integrated Logistics Systems (ILS)
- Site Connectivity
- CRD - VM:3/2000





Rapidly Evolving To Proof of Concept, Need Resources to Complete

Manufacturing shipping with a view to test durability/reliability







## Project: Global CPG Materials Management 2004

### Objectives:

- Demonstrate and implement an e-tag technology based solution that will provide CPG's a global production/material tracking system.
- Provide a One-Stop Shop Web Application for all Project related material Data (GT, Safety, MSD, material).
- Develop e-tag solution applicable to process digitalization of global supply chain, on-demand inventory tracking, and similar services.

### Technical Approach

#### At Shipping Facilities:

- As the shipped materials are loaded into a case, they are automatically converted into a case tag that is an e-tag-e-tag with readability capability and visual or audible output.
- The tag is mounted onto a case at the same time as the packing list is attached.
- Shipping data is synchronized to a material management website under CPG's development.

#### At Customer Site:

- As the truck pulls at the gate in customer's site, a local reader system/handheld reader will read each case tag to ensure that all parameters are properly entered. Notification will be transmitted back to the Web website.
- A handheld reader will enable on-site field engineers to match case concepts of each truck with the project information, like field.
- A handheld online hand reader reader will help on-site field engineers to locate tracked items.

### Information Infrastructure

- Hardware and Web architecture and software design to support material management internet application.
- Engineering development.

### Schedule and Deliverables

#### Project Goals



## Functional Tags

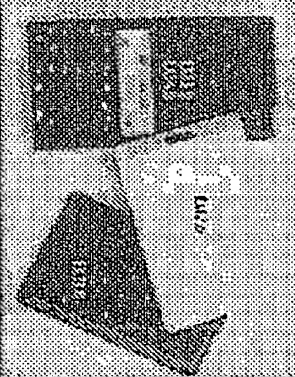
### Proposed Devices to be used during

#### Basic Functions:

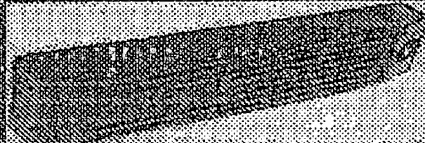
- ID
- Data Processing
- Memory
- Wireless
- Read/Write
- Locating Device

#### Functional Tags:

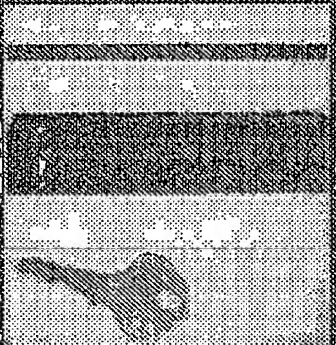
- Documents - Maintenance History / Records
- Storage - Packing List / BOM
- Temperature - Temperature history & event
- Tamper - Security access control
- Vibration - Machine vibration analysis/condition monitoring
- Accelerometer - Collision record & compliance monitoring
- Level - Height of liquid/acid level monitoring
- Chemical - Detection of moisture, smoke, etc...
- GPS - Global tracking, truck routing record
- Tilt - Shipping & operation compliance



(size comparable to light switch cover)



(size comparable to small pen)



Avg. Read Range: 40-140  
meters  
Avg. Battery Life: 5-7 Years  
Memory: current up to 1 MB (size & features similar to house key)

Highly durable, long read range and low profile tags are now available.



## Wireless Devices

### Proposed Devices to be used

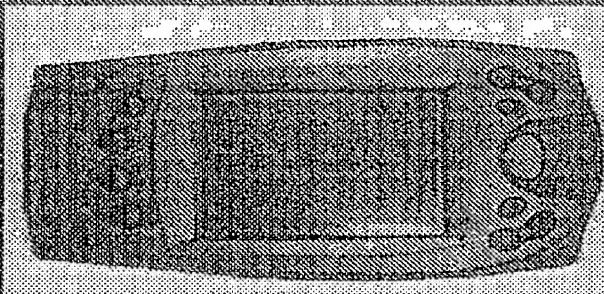
#### Basic Functions:

- Graphical Device Interface
- Touch-screen Windows Interface
- Windows CE

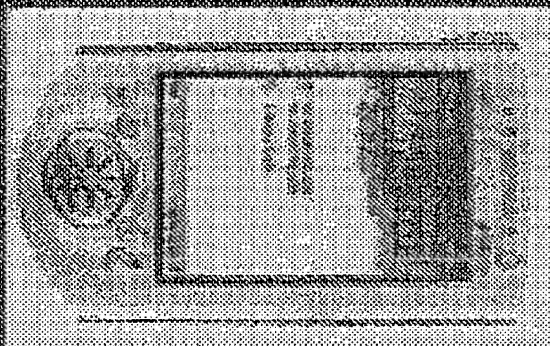
#### Current Functions:

- Bar Code Scanner—Reads standard bar code formats
- RFID—Reads and writes radio frequency ID data
- Wireless Communication—Connects to wireless LAN
- Data Logging—Records scanned data

## HANDHELD RFID READERS



Symbol



Ipaq 3600 Series

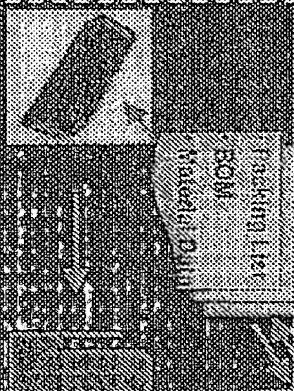
Develop Platform Independent Applications, Use "Best-In-Breed" Hardware



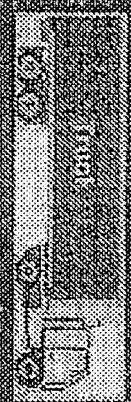
Fig. 1

# SCM SILEN

MSD Vendor (approx 2-3 vendors)



- Tag add on functionality for transportation
- Accelerometers record shipping damage
- Temperature sensors record data on temperature sensitive material
- Data Storage allows recording of maintenance performed



Logistics

Leverage Existing Infrastructure

• Tags placed on cases

• Handheld Device scan or download contents of tags

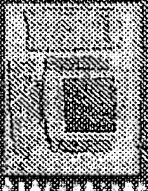
• Devices transmit shipment data to RCM/MS system

• Tag 2 referenced to existing case ID

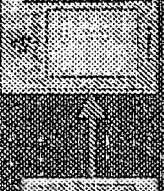
• Number in system

# Routing Center

Similar Supply Chain Application



Part of project Site Visit



Logistics

Leverage Existing Infrastructure

• Tags placed on cases

• Handheld Device scan or download contents of tags

• Devices transmit shipment data to RCM/MS system

• Tag 2 referenced to existing case ID

• Number in system

• Tags placed on cases

• Handheld Device scan or download contents of tags

• Devices transmit shipment data to RCM/MS system

• Tag 2 referenced to existing case ID

• Number in system

• Tags placed on cases

• Handheld Device scan or download contents of tags

• Devices transmit shipment data to RCM/MS system

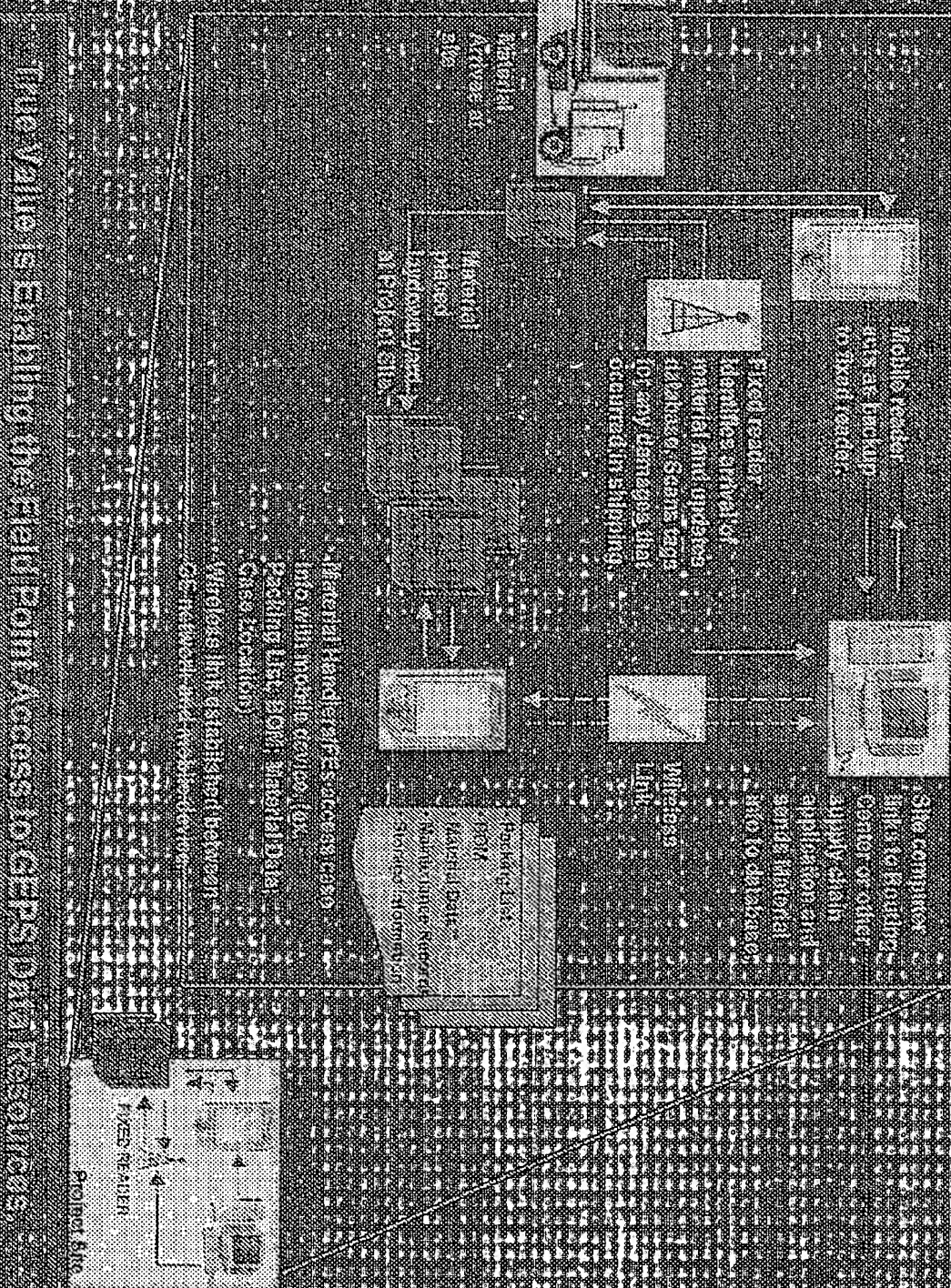
• Tag 2 referenced to existing case ID

• Number in system



# Tag Proposed

## Project Site



True Value is Enabling the Field Point Access to CEPS Data Resources.



# Green Belt Project of the Month - A20396.3

4/01

Materials Management Program

4/01 (F1160)

MMMR 1.0

MMMR 2.0

Packing List

01/98

## Problem Statement / Project Scope

- Lack of visibility on material ship status.
- Difficult to identify lost, missing or misdirected material.
- Conduct manual documentation of material.

## Solution Selected

- Leverage Logistics Routing Center.
- Quick implementation.
- Minimal IT work to develop application.
- Simplistic web application.
- Internet-based web application.

## Benefit Summary

## Benefits

Savings Type: Cost Reduction

|               |                |      |            |
|---------------|----------------|------|------------|
| PPSD          | Equip. MHS     | 2001 | 12-12-0005 |
|               | Ext. Scope MHS |      |            |
| Total Benefit |                |      |            |

Digitization Quick Hit: Building Block for a Global Materials Management System



# Next Generation Materials Management

4/01

Materials Management Program

Act 101 (Pilot)



## Problem Statement / Project Scope

- No Standardized Material Management Methods.
- Project Site Productivity Wasted On Material Issues (Finding Material).
- Lack of Global Availability of Material Inventory Status/Information.
- Need for 'Real-Time' Delivery Verification.
- Lack of Field Site Configuration Management & Data Capture.

## Possible Solutions



## Next Actions

- Reviewing MMMP with Business.
- Identifying Target Cost / Benefits.
- Pilot - 3Q 2001 SOCHEN ST/GEN Material.

## Functional RFID eTags Capability

- Documents
- Storage
- Temperature
- Vibration
- Acceleration
- GPS
- Chemical
- After Market

Change from Customer "Cost Element" To "Added Value Element" Cycle \$\$. Info.

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